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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/888,261	06/21/2001	Sergey Nikolskiy	18563-003410 AT-00075.1	9129

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EXAMINER	
SHARON, AYAL I	

ART UNIT	PAPER NUMBER
2123	

DATE MAILED: 03/28/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/888,261	NIKOLSKIY ET AL.	
	Examiner	Art Unit	
	Ayal I. Sharon	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 December 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-15 and 17-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-15 and 17-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *03 August 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Introduction

1. Claims 1-15 and 17-20 of U.S. Application 09/888,261 are currently pending. The application was originally filed on 06/21/2001.
2. Claims 21-44 have been cancelled in Applicant's response filed 12/27/05.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. The prior art used for these rejections is as follows:

   a. U.S. Patent 5,975,893 to Chishti et al. ("**Chishti**").

   b. Yamani, S.M. et al. "A System for Human Jaw Modeling Using Intra-Oral Images". Proc. of the 20th Annual Conf. of the IEE Eng'g in Medicine and Biology Society. Nov.1, 1998. Vol.2, pp.563-566. ("**Yamani**").

   c. Bourke, Paul. "Coordinate System Transformation". June 1996. ("**Bourke**").

6. The claim rejections are hereby summarized for Applicant's convenience. The detailed rejections follow.

7. **Claim 1-3, 13-15, 17, and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chishti in view of Yamani.**

8. In regards to Claim 1, Chishti teaches the following limitations:

1. A computer-implemented method for generating a computer model of one or more teeth, comprising:

receiving as input a digital data set of meshes representing the teeth;
(See Chishti, especially: col.9, line 43 to col.10, line 7)

selecting a curved coordinate system with mappings to and from a 3D space;
(See Chishti, especially: col.10, line 66 – col.11, line 42)

Chishti teaches (col.10, lines 31-34) that "individual teeth and other components will be 'cut'".

generating a function in the curved coordinate system to represent each tooth;
(See Chishti, especially: col.11, lines 39-50: col.13, lines 45-47; Fig.4A and associated text at col.12, lines 2-3)

However, Chishti does not expressly teach the following limitation:

and rendering a graphical representation of the teeth using the computer model wherein the rendering comprises rendering the teeth at a selected one of multiple orthodontic-specific viewing angles.

Yamani, on the other hand, does expressly teach this limitation (see Yamani, Fig.4).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Chishti with those of Yamani, because "such a model will be a tremendous asset in dental training and teaching." (Yamani, p.564, first para.)

9. In regards to Claim 2, Chishti teaches the following limitations:

> 2. The method of claim 1, further comprising displaying the computer model of the teeth using the function and the coordinate system.
> (See Chishti, especially: col.11, line 58 – col.12, line 8; and Fig.4 and Fig.4A)

10. In regards to Claim 3, Chishti teaches the following limitations:

> 3. The method of claim 1, further comprising storing a compact coordinate system description and the function in a file representing a compressed version of the digital data set.
> (Chishti, especially: col.10, lines 52-56.)

Examiner interprets that the "parallel set of digital data set ... at a lower resolution" corresponds to the claimed "compressed digital representation."

11. In regards to Claim 13, Chishti teaches the following limitations:

> 13. The method of claim 1, further comprising receiving an instruction from a human user to modify the graphical representation of the teeth and modifying the graphical representation in response to the instruction.
> (See Chishti, especially: col.11, line 58 – col.12, line 8; and Fig.4 and Fig.4A)

12. In regards to Claim 14, Chishti teaches the following limitations:

> 14. The method of claim 13, further comprising modifying the selected data set in response to the instruction from the user.
> (See Chishti, especially: col.11, line 58 – col.12, line 8; and Fig.4 and Fig.4A)

13. In regards to Claim 15, Chishti teaches the following limitations:

> 15. The method of claim 13, further comprising allowing a human user to select a tooth in the graphical representation and, in response, displaying information about the tooth.

(See Chishti, especially: col.11, lines 13-15 and lines 58-64)

14. In regards to Claim 17,

17. The method of claim 13, further comprising providing a user interface through which a human user can provide text-based comments after viewing the graphical representation of the teeth
(See Chishti, especially: col.14, lines 16-23)

15. In regards to Claim 19,

19. The method of claim 1, further comprising delivering data representing positions of the teeth at selected points along treatment paths to an appliance fabrication system for use in fabricating at least one orthodontic appliance structured to move the teeth toward final positions.
(See Chishti, especially: col.12, line 28 to col.13, line 26)

16. In regards to Claim 20,

20. The method of claim 1, further comprising detecting teeth collision using the curved coordinate system.
(See Chishti, especially: col.11, lines 3-21)

17. **Claims 4-8 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chishti in view of Yamani and further in view of Official Notice.**

18. In regards to Claim 4, Chishti teaches the following limitations:

4. The method of claim 3, further comprising transmitting the file to a remote computer.

Official Notice is given that it was old and well known at the time the invention was made to exchange files between computers via a network.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Chishti with Official Notice, because doing so would facilitate the sharing of information between different computers.

19. In regards to Claim 5, Chishti teaches the following limitations:

5. The method of claim 4, further comprising displaying the computer model of the teeth using the function at the remote computer.

Official Notice is given that it was old and well known at the time the invention was made to exchange files between computers via a network.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Chishti with Official Notice, because doing so would facilitate the sharing of information between different computers.

20. In regards to Claim 6, Chishti does not expressly teach the following limitation:

6. The method of claim 4, wherein the file is transmitted over a network.

Official Notice is given that it was old and well known at the time the invention was made to exchange files between computers via a network.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Chishti with Official Notice, because doing so would facilitate the sharing of information between different computers.

21. In regards to Claim 7, Chishti teaches the following limitations:

7.The method of claim 6, wherein the network is a wide area network.

Official Notice is given that it was old and well known at the time the invention was made to exchange files between computers via a wide area network (WAN).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Chishti with Official Notice, because doing so would facilitate the sharing of information between different computers.

22. In regards to Claim 8, Chishti teaches the following limitations:

8. The method of claim 6, wherein the network is the Internet.

Official Notice is given that it was old and well known at the time the invention was made to exchange files between computers via the internet.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Chishti with Official Notice, because doing so would facilitate the sharing of information between different computers.

23. In regards to Claim 18,

> 18. The method of claim 13, wherein rendering the graphical representation comprises downloading data to a remote computer at which a human viewer wishes to view the graphical representation.

Official Notice is given that it was old and well known at the time the invention was made to exchange files between computers via the internet.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Chishti with Official Notice, because doing so would facilitate the sharing of information between different computers.

24. Claims 9-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chishti in view of Yamani and further in view of Bourke.

25. In regards to Claim 9, Chishti teaches a 3D model of the jaw, including the teeth (col.10, line 66 to col.11, line 3). Chishti also teaches that the user can remove individual teeth, as well as the use of "spline curves" in this operation (col.11, lines 39-50).

However, Chishti does not expressly teach use of the specific coordinate system claimed in the following limitation:

> 9. The method of claim 1, wherein the coordinate system is based on equation:
> $V = P(\varphi, \theta) + R * Direction(\varphi, \theta)$
> where V is a corresponding point in three-dimensional (3D) space to (φ, θ, r),
> P and Direction are a vector functions expressed in terms of φ and θ.

Bourke, on the other hand, expressly teaches the use of a "spherical" / "polar" coordinate system in which a 3D coordinate space is defined by the following 3 parameters: φ, θ, and R.

The claimed formula {V = P(φ, θ) + R * Direction(φ, θ)} is inherent to the spherical coordinate system because it is the representation of a vector in terms of angle {P(φ, θ) } and magnitude {R * Direction(φ, θ)}.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Chishti with those of Bourke, because Bourke expressly teaches that "There are three prevalant coordinate systems for describing geometry in 3 space: cartesian, cylindrical, and spherical (polar)."

26. In regards to Claim 10, Chishti teaches the following limitations:

> 10. The method of claim 9, wherein the P and Direction functions are selected to minimize a deviation between the tooth model and a parametric surface specified by the curved coordinate system and the function.

Chishti teaches that the parameters of the brace are optimized to fit the teeth as best possible. (See Chishti, especially: col.12, line 28 to col. 13, line 15))

27. In regards to Claim 11,

> 11. The method of claim 9, wherein P and Direction are different for incisors and molars.

It is inherent that incisors and molars have different locations, and therefore different coordinates, in a visual display of teeth in the mouth.

28. In regards to Claim 12, Chishti does not expressly teach the claimed limitations:

> 12. The method of claim 1, further comprising determining a radius value.

Bourke, on the other hand, expressly teaches the use of a "spherical" / "polar" coordinate system in which a 3D coordinate space is defined by the following 3 parameters: φ, θ, and R. Examiner interprets that "R" corresponds to applicants' claimed "radius".

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Chishti with those of Bourke, because Bourke expressly teaches that "There are three prevalant coordinate systems for describing geometry in 3 space: cartesian, cylindrical, and spherical (polar)."

Response to Arguments

29. Applicants' arguments filed 12/27/05 have been fully considered but they are not persuasive.

30. The Applicants unpersuasively argue the following in regards to claim 1 (see p.5 of the arguments):

> Chrishti does not describe "receiving as input a digital data set of meshes representing teeth." In fact, Chrishti does not use the word "mesh" or meshes" anywhere in the specification. Similarly, Chrishti does not describe "selecting a curved coordinate system with mappings to and from a 3D space" or "generating a function in the curved coordinate system to represent each tooth."

31. In response, the Examiner reminds the Applicants that according to MPEP § 2131:

> The elements must be arranged as required by the claim, but this is not an *ipsissimis verbis* test, i.e., identity of terminology is not required. *In re Bond*, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990).

32. Examiner finds that Chrishti does indeed teach the cited limitations, but with different terminology.

33. Chrishti teaches that "a digital data set representing an initial tooth arrangement is obtained, referred to hereinafter as the IDDS." (see col.9, lines 18-20). Examiner interprets that the IDDS corresponds to the claimed mesh, for the reasons detailed in the following paragraphs.

34. Chrishti teaches that the IDDS (the initial tooth arrangement digital data set) is obtained by: (1) scanning or imaging the tooth arrangement, and then (2) digitizing the image. Chrishti expressly teaches the following (see col.9, lines 14-27. Emphasis added):

> The IDDS may be obtained in a variety of ways. For example, the patient's teeth may be scanned or imaged using well known technology, such as X-rays, three-dimensional x-rays, computer-aided tomographic images or data sets, magnetic resonance images, etc. **Methods for digitizing such conventional images** to produce data sets useful in the present invention **are well known** and described in the patent and medical literature.

35. Chrishti then proceeds to incorporate by reference relevant prior art. Chrishi also expressly teaches a preferred embodiment for obtaining the IDDS: (1) obtaining a plaster cast of the patient's teeth, then (2) digitally scanning the plaster cast using a conventional laser scanner or other range acquisition system. See the following (see col.9, lines 27-42. Emphasis added):

> Usually, however, the present invention will rely on **first obtaining a plaster cast of the patient's teeth** by well known techniques, such as those described in Graber, Orthodontics: Principle and Practice, Second Edition, Saunders, Philadelphia, 1969, pp. 401-415. **After the tooth casting is obtained, it can be digitally scanned using a conventional laser scanner or other range acquisition system to produce the IDDS.** The data set produced by the range acquisition system may, of course, be

> converted to other formats to be compatible with the software which is used for manipulating images within the data set, as described in more detail below. General techniques for producing plaster casts of teeth and generating digital models using laser scanning techniques are described, for example, in U.S. Pat. No. 5,605,459, the full disclosure of which is incorporated herein by reference.

36. Chrishti then expressly teaches the use of a specific digital scanner: the Cyberware Model 15 (see col.9, lines 65-67. Emphasis added):

> A preferred range acquisition system is an optical, reflective, non-contact-type scanner. Non-contact-type scanners are preferred because they are inherently nondestructive (i.e., do not damage the sample object), are generally characterized by a higher capture resolution and scan a sample in a relatively short period of time. **One such scanner is the Cyberware Model 15 manufactured by Cyberware, Inc., Monterey, Calif.**

37. With this office action, Examiner is providing a copy of the following reference:

    a. Stawser, D. and J. Cellini, "Training Manual for Ball State University Cyberware Model 15, 3-D Laser Scanner." Dec. 16, 1999. http://www.bsu.edu/classes/flowers2/training/m15/m15man.html. ("**Strawser**").

The Strawser reference expressly teaches that the digital data scans produced by the Cyberware Model 15 are referred to as "Meshes". (See Strawser, pp.1 and 9-11).

38. Examiner therefore finds that Chrishti teaches the cited limitation (of "meshes") but with different terminology ("IDDS").

39. Similarly, in regards to the claimed limitations of "selecting a curved coordinate system with mappings to and from a 3D space" and "generating a function in the

curved coordinate system to represent each tooth", Chrishti teaches the cited limitation but with different terminology.

40. Examiner interprets that Chishti's "saw tool [that] defines a path for cutting the graphic image by using two cubic B-spline curves lying in space, possibly constrained to parallel planes" inherently requires a "curved coordinate system with mappings to and from a 3D space", as claimed by the Applicants (See Chrishti, col.11, lines 39 to col.12, line 3 and Fig.4A).

41. Moreover, Examiner interprets that the use of the B-spline curves to "cut" (separate) teeth corresponds to Applicants' "generating a function in the curved coordinate system to represent each tooth", because the curves are used to separate individual teeth. (See Chrishti, col.11, lines 39 to col.12, line 3 and Fig.4A).

Conclusion

42. The following prior art, made of record and not relied upon, is considered pertinent to applicant's disclosure.

43. Cyberware M15 3D Scanner. © 1998-2006. http://www.headus.com/au/cyberware/m15.html.

44. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory

action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ayal I. Sharon whose telephone number is (571) 272-3714. The examiner can normally be reached on Monday through Thursday, and the first Friday of a bi-week, 8:30 am – 5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Rodriguez can be reached at (571) 272-3753.

Any response to this office action should be faxed to (571) 273- 8300, or mailed to:

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Alexandria, VA 22314

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Tech Center 2100 Receptionist, whose telephone number is (571) 272-2100.

Ayal I. Sharon
Art Unit 2123
March 20, 2006

Paul L. Rodriguez 3/23/06
Primary Examiner
Art Unit ~~2125~~ 2123